
U.S. Army Corps of Engineers Fort Worth District

Final Sampling and Analysis Plan

Bosque and Leon River Watersheds Study

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Quality Assurance Project Plan
Site Safety and Health Plan
Field Sampling Plans

ACRONYMS

bgs	below ground surface
BRA	Brazos River Authority
CO	Contracting Officer
CQC	contractor quality control
CSM	conceptual site model
DQOs	data quality objectives
FSP	field sampling plan
FTL	Field Team Leader
HSM	health and safety manager
MS/MSD	matrix spike/matrix spike duplicate
MWH	MWH Americas, Inc.
NWIRP	Naval Weapons Industrial Reserve Plant
PM	project manager
ppb	parts per billion
QAPP	quality assurance project plan
QA/QC	quality assurance/quality control
RCRA	Resource Conservation and Recovery Act
SAP	sampling and analysis plan
SSHP	site safety and health plan
TIEHH	The Institute of Environmental and Human Health at Texas Tech University
TNRCC	Texas Natural Resource Conservation Commission
USACE	U.S. Army Corps of Engineers Fort Worth District
USEPA	U.S. Environmental Protection Agency

1.0 INTRODUCTION

This sampling and analysis plan (SAP) was prepared to support the U.S. Army Corps of Engineers Fort Worth District (USACE) Bosque and Leon River Watersheds Study. The purpose of the USACE study is to assess the impact of perchlorate releases associated with the former Naval Weapons Industrial Reserve Plant at McGregor, Texas (NWIRP McGregor) on Lake Belton and Lake Waco water quality, and to evaluate potential human and environmental exposure to perchlorate in the Lake Belton and Lake Waco study area. NWIRP McGregor is located approximately 20 miles southwest of Waco, Texas, as shown on Figure 1-1.

This SAP includes three additional component documents: 1) the task-specific field sampling plans (FSPs), 2) the quality assurance project plan (QAPP), and 3) a site safety and health plan (SSHP). Together these documents compose the SAP. The QAPP and SSHP are written as comprehensive stand-alone documents that are included as attachments to the SAP. A separate stand-alone FSP will be written for each field program that will be implemented to support the Bosque and Leon River Watersheds Study. The task-specific FSPs will be prepared as addenda to this SAP. Additional information regarding the SAP component documents is presented in Section 5.0.

MWH Americas, Inc. (MWH) prepared this SAP for the USACE through authorization provided in contract DACW57-97-D-004, Task Order DY01, Modification No. 003. This SAP has been prepared in accordance with the USACE Statement of Work dated May 7, 2002, and the *Requirements for the Preparation of Sampling and Analysis Plans* (EM 200-1-3; USACE, 2001).

1.1 CONCEPTUAL SITE MODEL

A conceptual site model (CSM) was prepared to provide a preliminary conceptual understanding of potential human and environmental exposures to perchlorate in the Lake Belton and Lake Waco study area (MWH, 2002). The CSM comprehensively incorporated available information on sources of perchlorate contamination, the surface hydrology and hydrogeological characteristics of the Bosque and Leon River watersheds, the nature of perchlorate fate and transport, potential pathways of perchlorate migration within the study area, and the potential human receptors and environmental resources that may receive exposures to perchlorate. This information was used to identify data gaps in the current understanding of perchlorate migration and exposure within the study area, and to identify additional investigation activities aimed at filling such data gaps. This SAP was prepared to describe the project requirements for all field, laboratory, and data assessment activities associated with the proposed additional investigation activities identified in the CSM.

1.2 DOCUMENT ORGANIZATION

This SAP consists of five sections including this introduction. The remaining sections include:

- Section 2.0 Site Description and Background. Summarizes the project history and site background information.
- Section 3.0 Document Scope and Objectives. Describes the purpose and scope of this SAP, and summarizes the data gaps and additional investigation activities identified in the CSM.
- Section 4.0 Project Organization. Describes the multi-disciplinary project team and identifies the roles in preparing this SAP and performing the field investigations.
- Section 5.0 Sampling and Analysis Plan Component Documents. Describes the companion documents to this SAP including the task-specific FSPs, the QAPP, and the SSHP.
- Section 6.0 Contractor Quality Control. Describes the three-phase quality control program that will be implemented by the field team that allows the USACE a method of ensuring that all field activities are performed in accordance with the project requirements and conformance to this SAP.
- Section 7.0 References. Lists the sources cited in this SAP.

2.0 SITE DESCRIPTION AND BACKGROUND

Since the primary sources of perchlorate contamination within the Bosque and Leon River watersheds are suspected to have resulted from former activities at NWIRP McGregor, a brief historical summary of this facility, a description of the USACE perchlorate study area, a description of the environmental setting, and a brief summary of previous perchlorate investigations are presented in this section. Details regarding the historical use and investigation history at former NWIRP McGregor are included in the *Final Conceptual Site Model Bosque and Leon River Watersheds Study* (MWH, 2002).

2.1 NWIRP MCGREGOR HISTORY

The U.S. Army Ordnance Corps originally established the property, currently referred to as NWIRP McGregor, as the Bluebonnet Ordnance Plant in 1942 on 18,000 acres. During this tenure, it included facilities run by National Gypsum, of Buffalo, New York, to load explosives into bomb bodies during World War II. Production at this facility ceased at the conclusion of the war and the facility was formally closed in 1946.

After World War II, changes in ownership of the property occurred often and included sales to private parties and to Texas A&M University. In 1952, the U.S. Air Force acquired 11,450 acres of the original 18,000 acres and named the area U.S. Air Force Plant 66. Phillips Petroleum Company oversaw the production of jet-assisted take-off boosters during this time period, until the U.S. Air Force expropriated the property to the U.S. Navy in 1966.

After the transfer from the U.S. Air Force, the property was renamed the Naval Weapon Industrial Reserve Plant, McGregor, Texas. In 1972, 70 acres were transferred to the McGregor School District, 33 acres surrounding the wastewater treatment plant were transferred to the City of McGregor, and 1,600 acres were sold to private parties. Currently, several thousand acres are leased for agriculture. From 1978 to 1995, the Hercules Corporation produced solid propellant rocket motors at NWIRP McGregor for a variety of missiles. Production of these weapons ceased in 1995, when Alliant Techsystems, Inc. purchased Hercules Corporation.

Currently, portions of the property deemed safe for commercial/industrial redevelopment are being transferred to the City of McGregor, Texas, by congressional order. As of June 2002, approximately 5,800 acres had been transferred to the City of McGregor.

2.2 STUDY AREA LOCATION AND DESCRIPTION

The USACE's perchlorate study area comprises a portion of the two watersheds that supply surface water to Lake Waco and Lake Belton in central Texas as shown in Figure 2-1. This area includes portions of the Leon River watershed and the Bosque River watershed, as well as groundwater throughout the study area. Lake Waco and Lake

Belton serve as the sole-source water supply for approximately 500,000 people in the surrounding communities including Waco, Killeen, Belton, and Temple (U.S. Census Bureau, 2001). Former NWIRP McGregor straddles the watershed boundary between Lake Waco and Lake Belton. Thus, storm water runoff and groundwater flowing from the NWIRP McGregor site contributes to these drinking water supplies.

The city of Temple's in-take structure downstream of the Lake Belton dam defines the southern boundary of the study area. The eastern boundary of the study area extends north from the city of Belton, located to the west of Interstate-35, and continues northeast along the Interstate-35 to the dam at Lake Waco. The dam at Lake Waco defines the northern boundary of the study area. The western boundary of the study area extends northwest away from Lake Belton along the western edge of the Leon River.

In addition to perchlorate contamination originating at NWIRP McGregor, the Bosque and Leon River Watersheds Study also will address potential contamination originating at Fort Hood, which adjoins the western boundary of the study area. The study area does not include environmental investigations within the boundaries of NWIRP McGregor; other parties are conducting these investigations. Neither is the USACE study intended to address or serve as environmental investigation within the boundaries of Fort Hood.

2.3 REGIONAL TOPOGRAPHY

The study area includes portions of McLennan, Coryell and Bell counties and lies in the Washita Prairie, the easternmost part of the Grand Prairie of Texas. The study area is characterized by gently rolling limestone hills and terrain covered by shallow soil and open land vegetation. Creeks and rivers incise this surface, and cliffs and bluffs develop along these waterways (EnSafe Inc., 1999).

The land surface in the vicinity of NWIRP McGregor consists of sloping, gently rolling hills and plains underlain by the Georgetown Main Street Limestone. Portions of the facility slope toward the drainage tributaries of the South Bosque River, Harris Creek, and Station Creek (EnSafe Inc., 1999). Other small drainage ditches and various tributaries contribute to these larger streams. Small bluffs rise above some of the creeks and streams, particularly along tributaries of Harris Creek and the South Bosque River. Elevations at the base range from 840 feet above mean sea level in the northwest corner to 630 feet above mean sea level in the southeast corner of the NWIRP McGregor property. The majority of the property slopes to the southeast, except for the southwest corner where it slopes southwest towards Station Creek.

2.4 REGIONAL GEOLOGY

The Balcones Fault System, which is a north-northeast trending zone that closely parallels US Interstate 35, is located along the eastern edge of the study area (Hartmann and Scranton, 1992). The system is located at the confluence of two major physiographic systems: the Gulf Coastal Plain and the north Central Plains. Cretaceous rock units dip to

the southeast across the Balcones Fault System and into the Gulf Coast Basin. Beds strike northeast to southwest. The Balcones Fault Zone forms a regional boundary that is distinguished by a line of low hills that rise approximately 150 feet above the surrounding plain. However, the line of hills in the study area are erosional and not directly the result of the faulting in the area (Dr. Joe Yelderman, personal communication, August 1999).

Two normal, northeast trending faults of the Balcones Fault System cross the Leon River Valley, both of which are about 2,000 feet downstream from the Lake Belton dam. Displacements on both are about 30 feet and fault blocks are downthrown to the east (USACE, 1998).

Former NWIRP McGregor is situated atop the McGregor High. The McGregor High is a structural feature in the subsurface that caused erosion and nondeposition during the early Cretaceous, but it is questionable whether this has anything to do with the current topographic divide that occurs on the surface in the study area (Dr. Joe Yelderman, personal communication, August 1999).

A thin veneer of soil occurring in two physiographic provinces immediately underlies the study area: Grand Prairie and Blackland Prairie. Soils in the Grand Prairie province form over areas underlain by marl and limestone, whereas soils in the Blackland Prairie province overlie areas underlain by shale, marl, and chalk.

In general, the soil in the study area is not mature and frequently contains fragments of the limestone parent material. Soil thickness ranges from 0 to 6 feet below ground surface (bgs) and averages a depth of two feet. Vertical hydraulic conductivities range from 0.06 to 0.20 inches per hour, except in the presence of vertical desiccation cracks, which presumably increase vertical hydraulic conductivity. Desiccation cracks are a result of high clay content and form during extended periods of dryness (USACE, 1998).

Beneath the soil lies a transgressive-regressive sequence of early to middle Cretaceous fractured limestone of the Washita and Fredericksburg Divisions. These divisions primarily consist of interbedded shale and limestone. The early Cretaceous Trinity Group, also consisting of interbedded shale and limestone, underlies these units (EnSafe Inc., 1998). In the vicinity of NWIRP McGregor, the Georgetown Formation of the Washita Division is exposed and consists of the following members from approximate 0-100 fbg:

- Main Street Limestone;
- Pawpaw Shale;
- Weno Limestone; and
- Denton Marl (EnSafe Inc., 1998).

The Main Street Limestone is characterized as a fine to medium crystalline nodular limestone that has an average thickness of 35 feet. This unit is highly fractured and contains shallow groundwater as discussed further in Section 2.5. The lower portion of the Main Street Limestone was initially characterized as non-water bearing because it is

less weathered and contains fewer fractures and porosity features (EnSafe Inc., 1998). More recently, new data have been utilized to demonstrate that this zone is a zone of lower conductivity that is correlative across the NWIRP McGregor site (Montgomery Watson, 1999; Clark, 2000).

A sharp contact separates the Main Street Limestone from the underlying Pawpaw Shale, which acts as an aquitard, and consists of light gray shale that grades to silty shale with depth. The Pawpaw Shale is approximately 5-7 feet thick (EnSafe Inc., 1998).

The Weno Limestone is nodular, bedded limestone with alternating thin marl beds. The unit has a sharp upper contact and gradational lower contact and is approximately 36 feet thick in the McGregor Quadrangle (EnSafe Inc., 1998).

Finally, the Denton Marl is composed of soft marl with limestone ledges and has an approximate thickness of 7 feet (EnSafe Inc., 1998).

2.5 REGIONAL HYDROGEOLOGY

As discussed above, the Bosque and Leon River watersheds are comprised primarily of limestone and marl. These rocks primarily belong to the Washita Prairie Edwards Aquifer, the most significant water-bearing formation (Cannata and Yelderman, 1987; Cannata, 1988; Myrick, 1989). Depth to water in the unconfined aquifer is typically less than 10 meters and unconfined (Cannata, 1988; Collins, 1989). Recharge to the aquifer occurs in the uplands of the watersheds, where thinner soils and exposed bedrock fractures allow downward water percolation (Myrick, 1989). The primary flow through the aquifer is through fractures and bedding plans and is controlled by topography, with flow originating at the hills, and moving down to the valleys (Cannata, 1988; Collins, 1989; Myrick, 1989). Discharge of water is generally to streams and springs. Water quality typically reflects an increase in TDS with depth.

The hydraulic conductivity of the aquifer has been calculated to range from 10^{-3} m/s to 10^{-10} m/s (Clark, 2000). Aquifer heterogeneity is controlled locally by fractures caused by weathering, and regionally due to changes in lithology and tectonics.

Additional details regarding the hydrogeology of the Bosque and Leon River watersheds is presented in Section 5.2 of the CSM.

2.6 REGIONAL HYDROLOGY

Regional drainage and surface water in the study area flows toward the Brazos River, then southeast toward the Gulf of Mexico. In fact, The Brazos River Basin drains 15 percent of Texas's land area and eventually empties into the Gulf of Mexico.

In the study area, a number of rivers drain the surrounding watersheds into the Brazos River Basin, including the Bosque, Leon, and Little Rivers. In addition, local creeks and streams contribute to these principal tributaries to the Brazos River.

Former NWIRP McGregor is located on a topographic high near the confluence of four watersheds, two of which occur in the study area:

- Leon River watershed and
- Bosque River watershed.

The headwaters of several tributaries to these two watersheds originate at NWIRP McGregor. Additional details regarding the hydrology of the Bosque and Leon River watersheds is presented in Section 5.2 of the CSM.

2.7 SUMMARY OF PREVIOUS ENVIRONMENTAL INVESTIGATIONS

The U.S. Navy conducted an Environmental Baseline Survey of NWIRP McGregor from September to November 1995 after the production of rocket motors ceased. As part of this study, the Resource Conservation and Recovery Act (RCRA) Facilities Assessment identified eight potential sites for RCRA Facilities Investigations. This study and subsequent investigations and remedial activities are discussed in detail in reports published predominantly by EnSafe, the U.S. Navy's environmental contractor. The documents are available for review by the public at the McGinley Memorial Library at 317 S. Main, in McGregor, Texas, the official public repository for the U.S. Navy's work. Investigation and remediation activities are ongoing at the site.

Although the Navy has sampled a variety of media within the Lake Belton and Lake Waco watersheds, these investigations focused on the characterization of perchlorate contamination present at, or originating from, NWIRP McGregor. In addition to the Navy's investigations, the Brazos River Authority (BRA), Texas Natural Resource Conservation Commission (TNRCC), the City of Waco, The Institute of Environmental and Human Health at Texas Tech University (TIEHH), and other local agencies have sampled various media for perchlorate. A summary of these previous environmental investigations is presented in the CSM (MWH, 2002).

3.0 DOCUMENT SCOPE AND OBJECTIVES

The overall objective of this SAP is to assure that the proposed field programs will meet the goals and requirements of the Bosque and Leon River Watersheds Study. This document also will help to assure that the various project team members are aware of their responsibilities during the field-sampling program and will define the exact sampling activities to be performed. This SAP will be revised, if necessary, and approved prior to any field data-collection efforts.

This SAP is intended to provide details for the specific field investigation activities that are designed to fill the data gaps identified in the CSM. Data gaps identified in the CSM as 'high' priority and warranting further investigation include, but are not limited to, the following:

- Assessing fluctuations in stream perchlorate concentrations due to recharge events.
- Supplementing existing stream gauges to reduce uncertainties in the modeled water budgets for the Bosque and Leon River watersheds.
- Confirming perchlorate concentrations potentially reaching the lakes through focused surface water and sediment sampling in the Lake Waco and Lake Belton deltas.
- Evaluating an additional potential source of perchlorate to Lake Belton (e.g., Fort Hood).

The anticipated field investigation activities that are planned to fill these data gaps include:

- Longitudinal stream monitoring and sampling.
- Sediment pore water, algae, and surface water sampling within the delta areas of Lake Waco and Lake Belton.
- Surface water sampling at the Heather Run and Ridgewood Golf Course intakes from Lake Waco.
- Lake Belton fate and transport study.
- Sampling to evaluate the importance of the anoxic component of Lake Belton on perchlorate reductive metabolism.
- Groundwater dye-tracer studies.
- Additional sediment pore water, surface water, and groundwater sampling as deemed necessary by the project team.

Details for each of these field investigation activities will be presented in task-specific FSPs as described in Section 5.0.

4.0 PROJECT ORGANIZATION

The USACE has assembled an integrated, multi-disciplinary project team consisting of the USACE, Brazos River Authority (BRA), The Institute of Environmental and Human Health at Texas Tech University (TIEHH), MWH, the U.S. Environmental Protection Agency (USEPA), the Texas Natural Resource Conservation Commission (TNRCC), the City of Waco, and the City of Killeen to evaluate potential human and environmental exposure to perchlorate in the Lake Belton and Lake Waco study area. The primary goal of the project team is to evaluate potential human and environmental exposures to perchlorate in the Lake Waco and Lake Belton study area. To meet this goal, the USACE and its study team are currently engaged in a number of investigations to determine how perchlorate migrates through the environment, and to evaluate potential exposures and risks to public health and the environment.

This SAP is a component of these investigations and has been developed by MWH with input from BRA, TIEHH, and USACE as appropriate. Implementation of the field activities described in this SAP is anticipated to be a cooperative effort between MWH and BRA. A project organization chart is included on Figure 4-1.

5.0 SAMPLING AND ANALYSIS PLAN COMPONENT DOCUMENTS

Component documents to this SAP include the task-specific FSPs, QAPP, and the SSHP. A summary of the contents of each of these component documents is presented below.

5.1 FIELD SAMPLING PLANS

Individual FSPs will be prepared as addenda to this SAP for each field investigation activity identified in Section 3.0. Each FSP will provide guidance for all fieldwork by defining in detail the sampling and field data-gathering methods. Each FSP will include the task-specific data quality objectives (DQOs), sampling rationale and design, sampling equipment and procedures, documentation procedures, and the field quality control requirements. The task-specific FSPs will reference this SAP for project background information and Contractor Quality Control requirements (refer to Section 6.0).

5.2 QUALITY ASSURANCE PROJECT PLAN

The QAPP describes the chemical DQOs, analytical methods and measurements, the quality assurance/quality control (QA/QC) protocols necessary to achieve the chemical DQOs, and data assessment procedures. The QAPP has been prepared as a stand-alone attachment to this SAP and provides quality assurance guidance for all field and laboratory activities associated with this project.

5.3 SITE SAFETY AND HEALTH PLAN

The SSHP establishes the responsibilities, requirements, and procedures for the protection of all field personnel, and ensures a safe working environment during the execution of all field activities associated with this project. The SSHP includes an activity hazard analysis that will be updated as necessary to reflect the work activities described in each task-specific FSP. The SSHP has been prepared as a stand-alone attachment to this SAP, and will be kept on site during all field activities.

6.0 CONTRACTOR QUALITY CONTROL

The purpose of the contractor quality control (CQC) program is to provide the field team a self inspection system that allows the USACE a method of ensuring that all field activities are performed in accordance with the project requirements and conformance with this SAP and the stand-alone attachments. The CQC program consists of a three-phase control process that includes a preparatory phase, initial phase, and a follow-up phase. The control program is implemented prior to initiating each definable feature of work and will remain in effect throughout its duration.

The CQC program will also include inspections to be performed at the completion of a task. The project manager (PM) is responsible for implementing all phases of the quality control program. The field team leader (FTL) is responsible for managing and overseeing the subcontractors to ensure that all aspects of the work are performed in accordance with the contract documents and that sampling is performed in accordance with the SAP. Health and safety audits will also be conducted to ensure that all work is being performed in compliance with the SSHP. The health and safety audits will be performed by the health and safety manager (HSM).

6.1 DEFINABLE FEATURES OF WORK

A definable feature of work is a task that is separate and distinct from other tasks and has separate control requirements. Each task-specific FSP will identify the definable features of work. The three-phase control system will be implemented prior to the initiation of each feature of work.

6.2 PREPARATORY – PHASE CONTROL

The preparatory phase of the three-phase control program will occur prior to beginning work on a task. A preparatory meeting shall be conducted prior to field activities commencing to include the FTL and the field crew members. The Project Chemist also will conduct a preparatory meeting with the laboratory prior to initiating field activities. Documentation of the preparatory meetings will be prepared by the FTL and submitted to the USACE Technical Lead and USACE Project Chemist.

In addition, preparatory inspection of a task may be necessary when the task is first performed at each of the sites. The preparatory inspection includes providing the USACE Contracting Officer (CO) and the USACE PM with a preparatory inspection outline and performing a preparatory phase inspection prior to beginning work on the task. The inspection will include the following items:

- A review of the SAP, FSP, and QAPP to ensure that the task has been approved by the PM.

- A check to ensure that all required permits and clearances for the task have been obtained.
- A check to ensure that all required training for the task has been obtained by all personnel performing task.
- A check to ensure that the required health and safety training and medical monitoring has been completed and that the task will be performed in strict compliance with the SSHP.
- A check to ensure that all personnel performing the task have reviewed the SAP, FSP, QAPP, and SSHP.
- A discussion of the procedures that will be implemented for completing the task.
- A check to ensure that all the equipment and instruments required to perform the task are present.
- A check to ensure that all the required equipment and instruments for health and safety monitoring are present.
- A check to ensure that all the instruments are being calibrated to the manufacture and/or project specifications.
- An examination of the work area to ensure that all preliminary work has been performed and that conforms to the FSP, SAP and QAPP.
- A check to ensure that provisions are in place to allow for the required QC and safety inspections and audits during the task.

The following preparatory-phase checklists have been developed for field equipment and other materials and for use during the field activities. Items may be added or deleted from the checklist as appropriate for actual site conditions.

- Checklist of field equipment and other materials:
 - 1) Contract specifications
 - 2) Project plans (SAP, FSP, and SSHP)
 - 3) Field documentation materials (field forms and project notebook)
 - 4) Health and safety equipment
 - 5) Standard operating procedures
 - 6) Decontamination equipment (Alconox, distilled water, brushes, 5-gallon buckets, etc.)
 - 7) Sampling equipment (stainless-steel spoons, bowls)
 - 8) Sample containers and labels
 - 9) Sample shipping materials (coolers, ice, bubblewrap, strapping tape, custody seals, etc.)
 - 10) Laboratory information (shipping address, point of contact)
 - 11) Requested analyses.
- Checklist of field activities:
 - 1) The FTL shall review all pertinent sections of the plans and specifications (i.e., SAP, FSP, and SSHP) during the preparatory meeting in order to ensure

that all field personnel are cognizant of the overall project DQOs as well as any specific sampling and analysis requirements.

- 2) All instruments should be calibrated during the preparatory inspection meeting using certified calibration standards, gases, etc.
- 3) Equipment decontamination procedures will be demonstrated in detail using the proper decontamination solutions in accordance with this SAP.
- 4) A full set of sample custody and shipping forms will be completed to be used as a guide during sampling. The sample numbering system will be discussed. The laboratory addresses and phone numbers will be recorded on the shipping form. Analytical test methods will be discussed and recorded on the chain-of-custody form. Caution should be exercised to assure that the test method is clearly specified. All required data should be documented on this sample form.
- 5) The sampling team should demonstrate in detail how each type of sample will be collected, using the intended sample containers, sampling equipment, decontamination procedures, and data reporting requirements.
- 6) Laboratory turnaround times shall be established and documented in the minutes of the preparatory meeting. The CQC representative shall present a tracking system to assure that all data are received in a timely manner.

6.3 INITIAL-PHASE CONTROL

The initial inspections are performed when a representative portion of a task has been completed. The purpose of the initial phase is to ensure that tasks conform to the approved SAP, FSP, and QAPP. This phase includes a review of the procedures employed to complete the task and a check to ensure that the task is being performed according to the SSHP.

The following is a checklist of initial-phase control activities as they pertain to the confirmation, performance, and disposal-profiling sampling activities:

- The FTL should oversee the sampling activities and review the work for compliance with contract requirements.
- Individual sample labels and chain-of-custody forms will be inspected for accuracy, completeness, and consistency.
- The packaging and shipping of the samples will also be inspected by the CQC representative.

- Initial health and safety instrument calibration and ongoing calibrations will be observed, verified, and documented.
- Field notes will be inspected to assure that all pertinent data are recorded in accordance with the contract requirements. These notes shall include identification of field control samples (replicate samples, MS/MSDs), detailed sketches showing the sample locations, and any other items applicable to the project.
- The sampling team leader should review the sample summary tables located in the task-specific FSPs, which matches up primary and QA samples, at the conclusion of each day of sampling.

6.4 FOLLOW-UP PHASE CONTROL

Follow-up inspections will be conducted at regular intervals to ensure that the task is being performed in strict compliance to the project requirements. Follow-up inspections will be conducted at a minimum frequency of one inspection per event for each task. If follow-up inspections identify items in the task that do not conform to the project requirements, additional preparatory or initial inspections may be required. A follow-up inspection may be required at each work site for a specific task.

6.5 COMPLETION INSPECTION

A completion inspection will be performed when all work on a task at a specific site is complete. A list of items that do not conform to the project requirements for the task will be developed. The FTL will conduct a follow-up inspection to verify that the task was completed according to the project requirements and that corrective actions have been successfully implemented to address all deficient items.

6.6 NONCONFORMANCE/CORRECTIVE ACTIONS

This section describes corrective action procedures to be taken in the event a discrepancy is discovered by field personnel or during a desk or field audit, or the laboratory discovers discrepancies or problems. Potential discrepancies include, but are not limited to, improper sampling procedures, improper instrument calibration procedures, incomplete or improper sample preservation, and problems with samples upon receipt at the laboratory. In the event discrepancies are observed or identified, the following general corrective actions will be taken:

- Corrective Action. The nonconforming action will be immediately corrected to adhere to the procedures and protocols described in this SAP.

- Documentation. The nonconforming action and associated data will be documented in detail in the field logbook so that the usefulness of the data can be assessed.
- Notification. The sampling team leader will immediately notify the PM, who will in turn notify the USACE Technical Lead. The PM and Technical Lead will determine if the resulting data can be used or if resampling is necessary.

The USACE Contracting Officer, Project Manager, and Technical Team Lead will be notified in writing within 72 hours of the nonconformance. All nonconforming actions and the resulting impacts to the associated data will be documented in quarterly reports.

7.0 REFERENCES

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